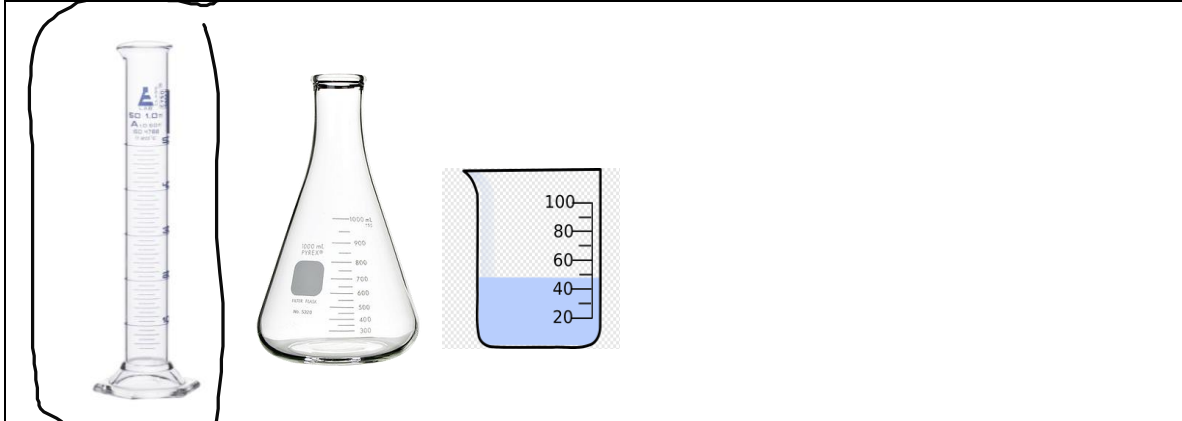


1. Which measuring device is most accurate?



2. Two students ran an experiment to determine the density of an unknown metal. Below are the results. Which student has the most precise data set?

Student A: 2.0 g/mL, 2.1 g/mL, 2.4 g/mL, 2.0 g/mL, 2.8 g/mL

Student B: 1.7 g/mL, 2.2 g/mL, 2.5 g/mL, 2.6 g/mL, 2.7 g/mL

Look at the difference between the low and high values in the data set. The smallest difference is most precise

Student A:  $2.8 - 2 = .8$

Student B:  $2.7 - 1.7 = 1$

3. Two students determine the boiling point of methyl alcohol. The results are shown below. The actual value is  $64.7^{\circ}\text{C}$ . What is the percent error for each student? Which student was most accurate?

Student A	$67.0^{\circ}\text{C}$
Student B	$61.1^{\circ}\text{C}$

$$\% \text{ error} = \frac{\text{accepted} - \text{experimental}}{\text{accepted}} \times 100$$

Smaller error

A:  $\frac{64.7 - 67}{64.7} \times 100 = -3.55$

B:  $\frac{64.7 - 61.1}{64.7} \times 100 = 5.56$

4. The data set shown represents student scores on an exam. The standard deviation is 14.2.

Period	Scores	Standard deviation
5	88, 58, 87, 56, 92, 100, 78, 86	15.8
7	66, 72, 82, 50, 76, 96, 78, 95	15.1

What is the mean (average) for each period?

p5:  $(88 + 58 + 87 + 56 + 92 + 100 + 78 + 86) / 8 = 81$

p7:  $(66 + 72 + 82 + 50 + 76 + 96 + 78 + 95) / 8 = 77$

What is the precision for each period?

p5:  $\frac{\text{std dev}}{\text{avg}} \times 100 = \frac{15.8}{81} \times 100 = 19.5$

p7:  $\frac{15.1}{77} \times 100 = 19.6$

5. The following data was collected from an experiment:

1.003 g, 1.005 g, 1.002 g, 1.000 g, 0.999 g, 1.008 g

(a) What is the mean or average?

$$(1.003 + 1.005 + 1.002 + 1.000 + 0.999 + 1.008) / 6 = 1.003 \text{ g} \quad /1$$

(b) The actual mass of the object is known to be 1.006 g. What is the percent error associated with this data set?

$$\% \text{ error} = \frac{\text{accepted} - \text{actual}}{\text{accepted}} = \frac{1.006 - 1.003}{1.006} \times 100 = 0.298 \quad /1$$

6. Two groups of students collected the following data:

Group A: 1.003 g, 1.005 g, 1.002 g, 1.000 g, 0.999 g, 1.008 g

Group B: 1.008 g, 1.015 g, 1.002 g, 1.000 g, 0.999 g, 1.010 g

The actual mass of the object is known to be 1.006 g

(a) Which data set is most precise? How do you know?

look at the difference between the high & low values  
A :  $1.008 - .999 = 0.009$  ← smaller, so more precise  
B :  $1.015 - .999 = 0.016$  /2

(b) Which data set is most accurate? How do you know?

Group A avg =  $(1.003 + 1.005 + 1.002 + 1.000 + 0.999 + 1.008) / 6 = 1.003 \text{ g}$   
Group B avg =  $(1.008 + 1.015 + 1.002 + 1.000 + 0.999 + 1.010) / 6 = 1.006 \text{ g}$  /2

the avg's are the same as the accepted

7. The exam scores for a chemistry are shown below. Use Google Sheets to answer the following,
- What is the average for each class?
  - What is the standard deviation for each class?
  - What is the precision for each class

Period 5	Period 7
95	88
87	89
66	90
100	77
78	95
98	80
77	79
85	78
78	90
82	88
88	82
99	96
90	78
68	77
78	90
90	98
88	90
67	100
88	98
65	88

Copy and paste the data into Sheets. Make sure 95 is in cell A1, 88 is in cell B2, 87 is in cell A2, etc.

for the averages do the following:

$$\begin{aligned} \text{type} &= \text{average}(A1:A20) \\ &= \text{average}(B1:B20) \end{aligned}$$

for the standard deviation:

$$\begin{aligned} \text{type} &= \text{stdev}(A1:A20) \\ &= \text{stdev}(B1:B20) \end{aligned}$$

for the precision:

$$\begin{aligned} \text{type} &= (A22/A21) * 100 \\ &= (B22/B21) * 100 \end{aligned}$$
